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Cover: Desert tortoise, *Gopherus agassizii*, emerging from its shelter in the Saguaro National Monument, Pima County, Arizona.
Photograph by Stephen L. Barten, D.V.M.

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The Occurrence of Desert Tortoises in Southeastern Arizona and adjacent Southwestern New Mexico

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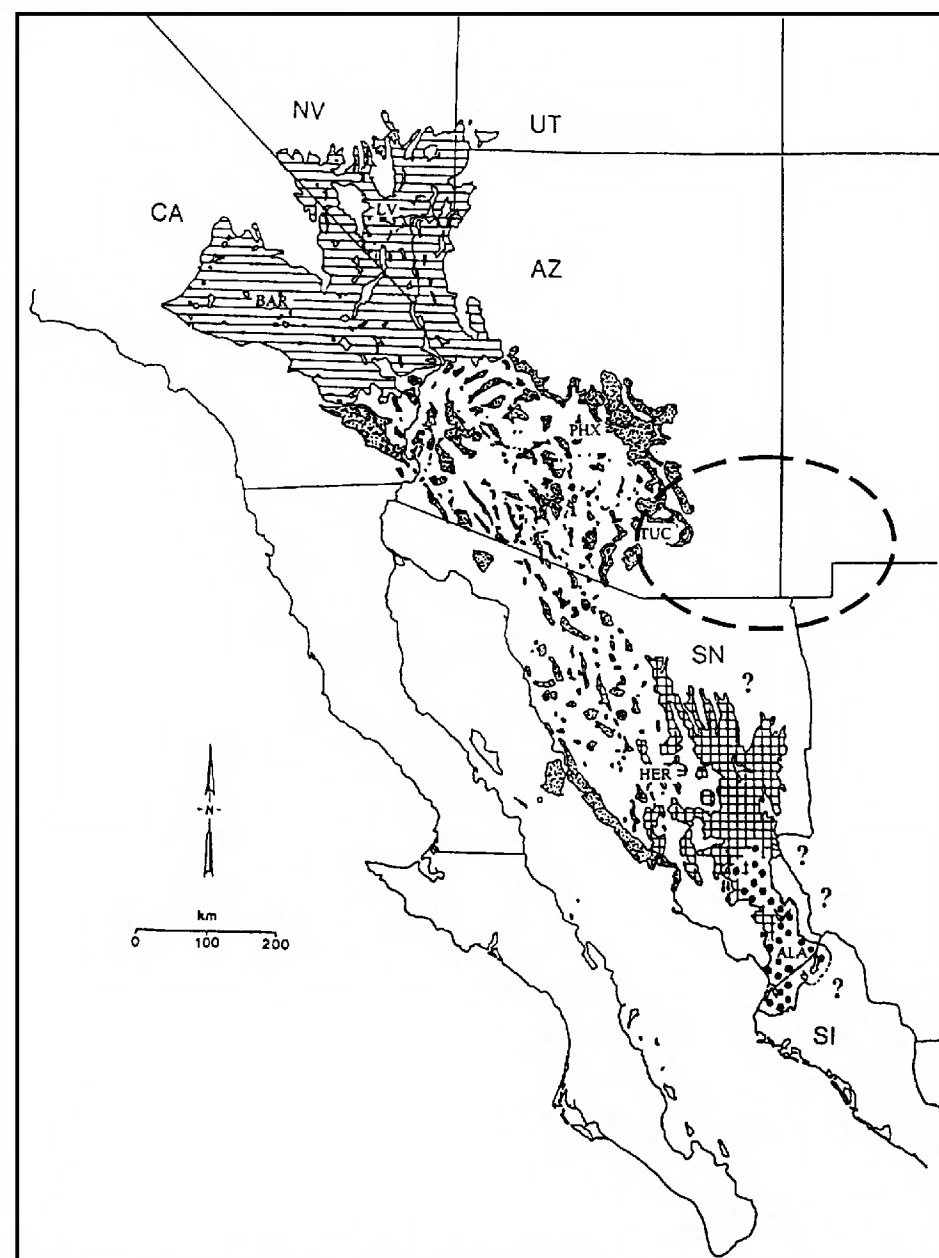
In the late 1970s and early 1980s there were several reports of desert tortoises, *Gopherus agassizii*, in southeastern Arizona and southwestern New Mexico. This area is approximately 100 to 135 km west of their easternmost documented natural distribution. The most recent and, to date, the most complete account of the desert tortoise (Van Devender, 2002) also briefly addresses the easternmost reports discussed here. This note presents some additional records and reports of these tortoises from the same area and comments on the factors possibly responsible for their occurrence.

As documented in the literature the current natural southeastern extent of the range of desert tortoise is somewhat problematic. Patterson (1982), for example, includes extreme southeastern Arizona as the eastern periphery of this tortoise's range in his original defining of its distribution, while other authors limit its range to western Arizona (Ernst et al., 1994; Germano et al., 1994) or consider eastern Arizona – western New Mexico as an area of "questionable occurrence" (Degenhardt et al., 1996). Van Devender (2002) illustrates a conservative distributional range map but mentions the eastern records in his text. The easternmost records of unquestioned natural occurrence in the United States are from Sulfur Springs Valley, Arizona, northeast of Tombstone (Miller, 1932) and near Benson (Barney Tomberlin, pers. com.).

A similar situation occurs in the Dixie Valley of Utah where there have been unresolved discussions regarding the natural occurrence of desert tortoises now living there (Hardy, 1945; Woodbury and Hardy, 1948; Bury et al., 1994). Many of the arguments both pro and con as to their status of natural occurrence parallel what is presented here. The current thinking is that the Dixie Valley tortoises are probably native, but the tortoises in Dixie Valley are protected under the Endangered Species Act regardless of their origin.

The easternmost desert tortoises reported here are from west of the Continental Divide in the San Simon, San Bernardino, and Playas Valleys. The first two of these valleys both straddle the Arizona and New Mexico boundary and are positioned between the Chiricahua and Peloncillo Mountains. Playas Valley is just northwest of the Peloncillos. From a zoogeographic perspective this region is in the Chihuahuan Desert with the Chiricahua Mountains separating this desert from the more western Sonoran Desert. The area also sits between the southern limits of the Rocky Mountains and the northernmost extensions of the Sierra Mestra range of Mexico. Many of biotic elements characteristic of both the Chihuahuan and Sonoran Deserts are found in these transitional valleys.

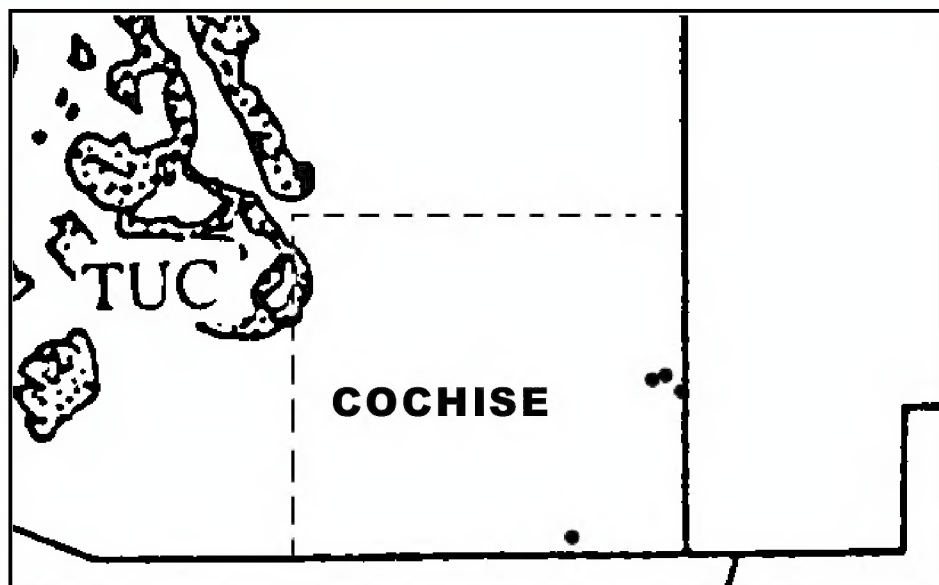
While the mountain ranges themselves provide west to east dispersal barriers for tortoises, extensive low elevation desert-grasslands connect the two deserts to the south of the Chiricahua Mountains. Similar grassland communities extend south from



The range of the desert tortoise, *Gopherus agassizii*, as shown in Van Devender (2002). The dashed oval indicates the area covered in detail in this report. Habitats: Mohave desertscrub (horizontal lines), Sonoran desertscrub (stippling), foothills thornscrub (crosshatching), and tropical deciduous forest / coastal thornscrub (closed circles).

the San Bernardino Valley of Arizona and the Rio Bavispe Valley in Sonora providing dispersal corridors and habitats to areas that are currently known to be occupied by desert tortoises in the Mexican portion of the Sonoran Desert. The distribution of desert tortoises in Mexico is still poorly understood, with only about 80 documented sites of occurrence throughout its extensive range in that country. While the most recently compiled distribution map for Mexico (Bury et al., 2002) does not suggest a direct southern linkage to southeastern Arizona and southwestern New Mexico within the historical period, it does indicate that the habitat in Sonora is continuous with the tortoise's occupied sites to the south. These habitats in Sonora and Chihuahua were subjected to the same historical degradations as those in the southwestern United States (see below), perhaps explaining a lack of modern records in this region of Mexico. Dispersal of tortoises into the geographic area discussed is possible, as evidenced by the presence of other Sonoran species in these valleys. Moreover, it is difficult to imagine why they would not have occupied these areas.

There are three recognized phenotypes of desert tortoises

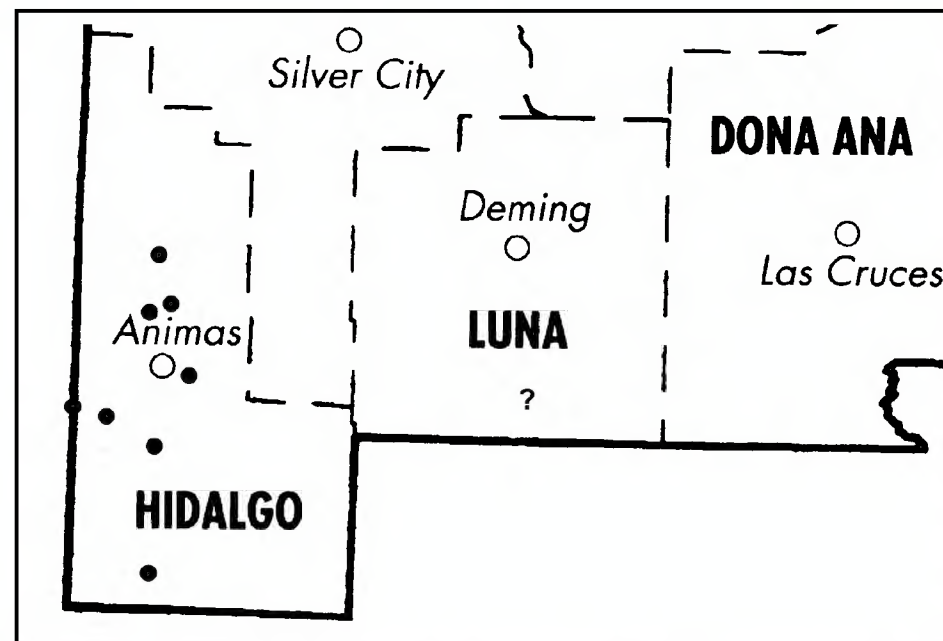


Extralimital localities for the desert tortoise (*Gopherus agassizii*) in southeastern Arizona. Solid circles indicate Cochise County localities mentioned in the text. Stippled areas represent the range as recognized by Van Devender (2002).

(Weinstein and Berry, 1988). Lamb and McLuckie (2002) discuss the genetic differences, and their importance, between the three geographic phenotypes of these tortoises. Examination of photographs and live tortoises from the region discussed shows them to be of the Sonoran phenotype. This is what would be expected both from natural dispersal as well as from human supported translocation. However, this does rule out translocations from other portions of the species' range. The latter would strongly indicate an introduced population. The photographs and tortoises examined also confirm that these tortoises are not a relict population or translocations of bolson tortoises (*G. flavomarginatus*) from the Chihuahuan Desert in Mexico. In the previous two decades a number of bolson tortoises have been seized at the Mexican border (Douglas, Arizona/Agua Prieta, Sonora) from Mexicans attempting to transport them into the United States.

The following records and reports are available: **Cochise Co., AZ**, foothills of eastern Chiricahua Mountains (8 km N junction San Simon and Portal Roads); N of San Bernardino National Wildlife Refuge; **Hidalgo Co., NM**, US Hwy. 80 ca. 1 and 2.5 km S of AZ/NM state line (2 records); Peloncillo Mountains nr. Rodeo; Gray Ranch ca. 10 km Cloverdale (Degenhardt et al., 1996; Hulse and Middendorf, 1979; Johnson et al., 1990).

I am aware of several additional records and firsthand reports from this same area which are presented here as follows: **Cochise Co., AZ**, Portal Road ca. .5 k from NM border, 4200 ft, October 1994 (pers. obs.); Whitetail Canyon Road summer, 2006 (pers. com., H. Bond), **Hidalgo Co., NM**, three separate ranches in Animas area late 1990s (photographic documentation); head of Post Office Canyon, 5400 ft, 17 June 1977 (photographic documentation); Playas Valley south of I-10, 1960s–70s (reports). Reports from utility workers indicate the possibility of additional tortoises in Luna County near Columbus, New Mexico. Just across the border there is a curio shop in Agua Prieta, Sonora, Mexico, that has displayed the shell of a Sonoran desert tortoise in its front window for at least 25 years. When quizzed about the shell (Jan. 2006) the shop's owner was unable to recall its origin. Not included are a number of reports made to me that were secondhand in nature.



Extralimital desert tortoise (*Gopherus agassizii*) localities mentioned in the text for southwestern New Mexico. Solid circles indicate Hidalgo County localities. Question mark in Luna County represents a report from the vicinity of Columbus.

The word on the street (well in this case a bar in Rodeo, New Mexico) is that a number of local ranchers have tortoises on their property. Most know the difference between the ornate box turtles (*Terrapene ornata*), which are quite common locally, and the tortoises that they only see on occasion. Almost to the person everyone requested that I not provide locality information for tortoises on their lands in that they feared the government would impose land use restrictions related to endangered species issues. While I do not believe this would actually be the case, I respect the perspective the local ranchers have on this issue and these reports are not included in the listing above.

So the question is not are the tortoises present in the area (questionable occurrence) but as to whether or not this represents a native relict population or just individual tortoises that have been released over time and have survived in the area. This latter explanation is the most straightforward one and will likely be the one that is endorsed by government agencies and the academic community. It would be difficult, if not impossible to demonstrate that these are not simply individual feral tortoises, and being long-lived and diurnal a single tortoise could be encountered a on a number of occasions over time.

On the other hand it is not possible to rule out that these tortoises do not represent a relict naturally occurring population. While this position cannot be proven, there are a number of factors to suggest natural occurrence should be considered.

Points regarding desert tortoises in southeastern Arizona and southwestern New Mexico

1. The scattered nature of the sightings and records indicates that if the tortoises do indeed represent released individuals, the releases would have been done by a number of people over an extended period of time. Furthermore, the fact that most of the reports are from vast private ranches with limited access implies it would be difficult for anyone other than land owners or ranch hands to have released the tortoises. Yet, neither the workers nor the owners are aware of anyone releasing tortoises on their lands in the past.
2. If the tortoises had been released by people traveling through, it seems that most of the records would be from

near public roads, or at least places with public access. Many reports are from sites far removed from public access and not exactly places that one could easily drop off a tortoise. In that many of these lands have been in family ownership for long periods and are generally closed to outside visitors, the circumstances related to the release of these tortoises are difficult to explain.

3. There is a long history of overgrazing and fire suppression in the region. This resulted in a mesquite-dominated landscape where native grasses and other plants characteristic of the valley and adjacent uplands were no longer dominant. This land use pattern extended from before the mid-1800s till the present. Only in recent years have ranchers and the Forest Service understood the key role of fire in maintaining the natural landscape and much of the land has yet to recover. Under this scenario tortoise populations, if they occurred, may have been reduced to small remnant groups where local conditions were less severely affected. These sites would, for the most, part be in isolated canyons and other places removed from continual grazing. In that there are few public roads in the remote back country areas, the lands are private ranches where people are not encouraged to wander, and in that the negative impact of overgrazing and fire suppression was well established prior to most systematic biological investigation it is not surprising that the tortoises have been overlooked.
4. The Apaches were present in this area through the 1860s and thereby prevented settlement and limited scientific exploration. While a number of western-based military physicians made major contributions to our understanding of the biota of the region there were no military forts in the area being discussed. Even the Mexican boundary surveys were completed prior to the surrender of the Apaches (Baird, 1859) so it seems unlikely that this specific region was well sampled.
5. From a zoogeography viewpoint this is a very complex area. More taxa of reptiles and amphibians, and mammals, occur here than any other location in the United States. Over half the species of birds in North America can be found in the Chiricahua Mountains. In that a large number of Sonoran plants and animals occur in the valleys discussed, from a zoogeographic perspective it is difficult to explain why desert tortoises would not naturally occur here.
6. These records are not random—they occur in habitats and at elevations where it would be reasonable to expect these tortoises to occur. In the Sonoran Desert tortoises occur on slopes, hills and multi-dissected sloping plains (Germano et al., 1994; Van Devender, 2002). In the valleys east of the Chiricahua Mountains the records and reports are from foothills and the upper ends of the valleys (4000–4500 ft), suggesting the tortoises are not distributed randomly or in a few clusters as would be expected if they represented releases. This distribution on a more limited scale mirrors the documented macro-distributional pattern of Sonoran desert tortoises in central and western Arizona (Van Devender, 2002). Known populations are isolated and mostly confined to upland desert areas not prone to periodic flooding. Furthermore of the eastern reports discussed here, both those in

Arizona and New Mexico are all confined the Lower Sonoran life zone as defined by Bailey (1913).

7. Except for planned long-term reintroduction programs there is evidence of failure and low survival rate of randomly released tortoises (Fusari et al., 1987; Dodd and Seigel, 1991). Conversely, random releases can result in non-breeding individual establishment. A number of gopher tortoises, *Gopherus polyphemus*, from Florida were released in southeastern North Carolina in the 1950s were still present 20–25 years later although there was no indication of reproduction. There was no follow-up on this group after the mid-1970s. (North Carolina State Museum records). Several other individuals released in the same general area in the mid-1990s are still extant (pers. obs.).
8. One of the tortoises reported here (Portal Road, 1984, pers. obs.) was a young animal that was approximately 150 mm in straightline carapace length. While this does not document reproduction of desert tortoises in the area, it at least suggests that a viable population may exist.
9. The fossil record contains desert tortoises from several sites in New Mexico (Eddy and Dona Ana Counties) showing that they at least extended east of their current recognized distributional limits to the lower Rio Grande drainage in times past. The more recent fossils have been dated at between 11,130 to 12,520 years before present (McCord, 2002) suggesting these tortoises were present in southern New Mexico up to the time of arrival of pre-Columbian man.

Conclusions

Factual conclusions are lacking. Based on available information it would be irresponsible to state that the tortoises living in the Portal/Animas area of Arizona and New Mexico are of natural occurrence. It would be equally unfair to simply ignore this “population” because it may be of introduced origin. It seems that from the 1930s onward when Miller (1932) defined the distribution of *Gopherus agassizii* authors have been reluctant to modify the species distributional limits, and extralimital records have been dismissed as introduced populations (e.g., Dixie Valley tortoises in Utah). A real problem with declaring that reports from a specific area are not of naturally occurring individuals is that to most these records then do not seem to have merit and subsequent encounters are not reported leaving problematic records and reports as singular isolated events.

One must also consider that these reports and records comprise a combination of introduced individual and small widely scattered relict populations. These could represent Pleistocene relicts or remnants of a population decline resulting from the documented misuse of the land by the early cattle industry. The reports from east of the Continental Divide seem to be the most questionable, but the elevation of the Divide nearest the areas discussed is 4,500 feet and is composed of desert grasslands. This elevation is inhabited by tortoises west of the Divide, so further eastward dispersal cannot be ruled out and the fossil record shows they were in the region prior to the historical period.

The area under discussion was severely ecologically de-

graded prior to serious biological investigation and we know that faunal density and diversity were drastically affected. Various attempts to establish cattle along what is now the United States/Mexican border started as early as 1540 and by the 18th and 19th centuries prospective ranchers, missions and the military had established extensive herds of live stock. In this period the San Bernardino Ranch (near Douglas, Arizona) had 100,000 cattle, 10,000 horses and 5,000 mules (Haskett, 1935). At the time expansion of cattle ranching was limited because of Apache raids and abandoned stock ran wild. By 1870–72 the Apaches were subdued, open range livestock ranching increased, and overgrazing became the norm. As many as 1,500,000 cattle were believed to be in southern Arizona by 1890. A severe drought in 1891–92 resulted in the unrecorded thousands of head dying from starvation. Subsequently livestock numbers on both sides of the border have varied in number from time to time and place to place but grazing pressures have persisted in the region for the last 100 years. In the San Bernardino and San Simon valleys this resulted in massive shrub invasions into what were formerly semi-arid perennial grasslands and foothills. During this same period settlement of the region resulted in the suppression of fire, the principal agent controlling invasive shrubs and maintaining open grasslands and foothills. The effects of this can still be seen today.

Photographs taken in 1892 and 1893 of the U.S./Mexican International Boundary monuments compared with ones taken in the present time document a marked change in vegetation over this time period (Humphrey, 1987) and the landscape shifted from abused overgrazed grasslands to arid, bare-ground shrub thickets. It should be noted however in the San Bernardino and San Simon Valleys extensive grazing was well established prior to the time the original photographs were taken. In fact the early photographs of the monuments in the area of southwestern New Mexico and southeastern Arizona show that the grasslands had been severely altered prior to the 1890s. In general the changes in the Chihuahuan Desert are extreme, and areas that formerly supported grasses or grass shrub mixtures are now scrub. The change is a one-directional movement toward a more arid scrub community.

The overriding question as to the native vs. introduced status of the small numbers of tortoises reported from east of the Chiricahua Mountains remains unanswered. They could be Pleistocene relicts or remnants of a more widespread population that became fragmented both in the U.S. and adjacent Mexico by land abuse resulting from centuries of overgrazing. Tortoises may have been translocated by man prior to the time of European contact or by European man from the Spanish Conquest through the homesteading period. It is not known if these populations, if they were introduced, are naturalized and viable, or if

the reports and records are simply of random individual survivors. Any one, or any combination of some or all of these factors could account for their current presence and rarity. Introduction of tortoises in modern times as the single source for current occurrence seems unlikely based on distribution and the relatively inaccessibility of the private lands on which the tortoises have been found. The other question is the relative abundance of tortoises in this region. Based on what we know the records and reports are largely random isolated events. Most residents of the area have heard about tortoises occurring locally but have never seen one themselves, and ranchers and others who have seen them for the most part have only encountered one or two in a lifetime. The density would appear to be extremely low, and no attempt has been made to determine if these sightings represent a viable population.

From both a conservation and zoogeographic viewpoint the tortoises that are found east of the Chiricahua Mountains are of potential interest. As the grasslands and foothills of the San Simon Valley continue to benefit from increased fire management and conservation efforts it would be expected that the tortoise population, no matter as to its origin, will expand. One of the sites of occurrence is a 1700-acre ranch in New Mexico that has not allowed grazing since 1972. Considering the public's growing interest in the species as well as the conservation status of this tortoise elsewhere in its range the tortoises in this area should not be ignored. Furthermore, with the changing conservation ethics of the local landowners in the San Simon Valley and adjacent valleys, canyons, and foothills the potential for an expansion of this population in a privately protected area could be of significance to the long-term survival of the species. Large tracts of land are currently in or are now being placed into legally binding, perpetual conservation easements. The importance placed by private local landowners on regional land conservation deserves increased appreciation (see discussion in Sayre, 2005), and it could serve as a basis for other chelonian conservation efforts on private lands elsewhere.

So we are left with a curious dilemma: should we follow our scientific training and reject records that cannot be verified as ones of natural occurrence, or accept the idea that as a stressed species the concept of a broader geographic distribution, natural or not, gives us more long-term conservation options? If we pick the latter choice, as it is certainly a logical one, how much of our limited research and conservation resources should we encumber for a small problematic population?

Acknowledgments

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Literature Cited

- Bailey, V. 1913. Life zones and crop zones of New Mexico. U.S. Department of Agriculture, Bureau of Biological Survey, North American Fauna No. 35.

- Baird, S. F. 1859. Reptiles of the Boundary, with notes by naturalists of the survey. Pp. 1-35. *In*: W. H. Emory, Report on the United States and Mexican Boundary Survey, made under the direction of the Secretary of the Interior. 34 Congress, 1st Sess., Sen. Exec. Doc. (108), Vol. II, Part II.
- Bury, R. B., T. C. Esque, L. A. Defalco and P. A. Medica. 1994. Distribution, habitat use, and protection of the desert tortoise in the eastern Mojave Desert. Pp 57-72. *In*: R. B. Bury and D. J. Germano, editors, Biology of North American tortoises. Washington, D.C.: Fish and Wildlife Research no. 13, U.S. Department of the Interior National Biological Survey.
- Bury, R. B., D. J. Germano, T. R. Van Devender and B. E. Martin. 2002. The desert tortoise in Mexico: Distribution, ecology, and conservation. Pp. 86-108. *In*: T. R. Van Devender, editor, The Sonoran desert tortoise: Natural history, biology, conservation. Tucson: University of Arizona Press and Arizona-Sonora Desert Museum.
- Degenhardt, W. G., C. W. Painter and A. H. Price. 1996. Amphibians and reptiles of New Mexico. Albuquerque: University of New Mexico Press.
- Dodd, C. K., Jr., and R. A. Seigel. 1991. Relocation, repatriation, and translocation of amphibians and reptiles: Are they conservation strategies that work? *Herpetologica* 47:336-350.
- Ernst, C. H., J. E. Lovich and R. W. Barbour. 1994. Turtles of the United States and Canada. Washington, D.C.: Smithsonian Institution Press.
- Fritts, T. H., and R. D. Jennings. 1994. Distribution, habitat use, and status of the desert tortoise in Mexico. Pp 49-56. *In*: R. B. Bury and D. J. Germano, editors, Biology of North American tortoises. Washington, D.C.: Fish and Wildlife Research no. 13, U.S. Department of the Interior National Biological Survey.
- Fusari, M., D. Beck, K. H. Berry, M. Coffeen, J. Diemer and J. A. St. Amant. 1987. A panel discussion of relocation and related issues and implications for management of desert tortoises. *Proceedings of the Desert Tortoise Council* 1984: 136-146.
- Germano, D. J., R. B. Bury, T. C. Esque, T. H. Fritts and P. A. Medica. 1994. Range and habits of the desert tortoise. Pp. 73-84. *In*: R. B. Bury and D. J. Germano, editors, Biology of North American tortoises. Washington, D.C.: Fish and Wildlife Research no. 13, U.S. Department of the Interior National Biological Survey.
- Hardy, R. 1945. The influence of soil types upon the local distribution of some mammals in southwestern Utah. *Ecological Monographs* 15:71-108.
- Haskett, B. 1935. Early history of the cattle industry in Arizona. *Arizona Historical Review* 6:3-42.
- Hulse, A. C., and G. A. Middendorf. 1979. Notes on the occurrence of *Gopherus agassizii* (Testudinidae) in extreme eastern Arizona. *Southwestern Naturalist* 24(3):545-546.
- Humphrey, R. R. 1987. 90 years and 535 miles: Vegetation changes along the Mexican border. Albuquerque: University of New Mexico Press.
- Johnson, T. B., N. M. Ladehoff, C. R. Schwalbe and B. K. Palmer. 1990. Summary of literature on the Sonoran Desert population of the desert tortoise. Report to U. S. Fish and Wildlife Service, Phoenix.
- Lamb, T., and A. M. McLuckie. 2002. Genetic differences among geographic races of the desert tortoise. Pp. 67-85. *In*: T. R. Van Devender, editor, The Sonoran desert tortoise: Natural history, biology, conservation. Tucson: University of Arizona Press and Arizona-Sonora Desert Museum.
- McCord, R. D. 2002. Fossil history and evolution of the gopher tortoises (genus *Gopherus*). Pp. 52-66. *In*: T. R. Van Devender, editor, The Sonoran desert tortoise: Natural history, biology, conservation. Tucson: University of Arizona Press and the Arizona-Sonora Desert Museum.
- Miller, L. 1932. Notes on the desert tortoise (*Testudo agassizii*). *Trans. San Diego Soc. Nat. Hist.* 7:187-208.
- Patterson, R. 1982. The distribution of the desert tortoise (*Gopherus agassizii*) Pp. 51-55. *In*: R. B. Bury, editor, North American tortoises: Conservation and ecology. Washington, D.C.: Wildlife Research Report 12, U.S. Department of the Interior Fish and Wildlife Service.
- Sayre, N. F. 2005. Working wilderness. Tucson: Rio Nevo Publishers.
- Van Devender, T. R. (editor). 2002. The Sonoran desert tortoise: Natural history, biology, conservation. Tucson: University of Arizona Press and Arizona-Sonora Desert Museum.
- Weinstein, M., and K. H. Berry. 1988. Morphological analyses of desert tortoise populations. Paper presented at the 1988 Desert Tortoise Council Symposium, Laughlin, Nevada. March 1988.
- Woodbury, A. M., and R. Hardy. 1948. Studies of the desert tortoise, *Gopherus agassizii*. *Ecological Monographs* 18:145-200.

Notes on the Reproductive Biology of the Costa Rica Scaly-eyed Gecko, *Lepidoblepharis xanthostigma* (Squamata: Gekkonidae), from Costa Rica

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Abstract

Gonadal material of the Costa Rica scaly-eyed gecko, *Lepidoblepharis xanthostigma*, from Costa Rica was histologically examined. Results of the first examination of monthly samples of *L. xanthostigma* testes are presented. All of the males in samples collected in February–August were undergoing spermiogenesis (sperm formation) indicating an extended reproductive season. Similarly, reproductively active females were recorded from March–September and December. Mean clutch size for 30 females was 1.0 ± 0.0 . Minimum sizes for reproductive activity in males and females are provided. My data support previous observations that *L. xanthostigma* has an extended reproductive season, but there was no evidence to indicate *L. xanthostigma* females produce multiple clutches.

The Costa Rica scaly-eyed gecko, *Lepidoblepharis xanthostigma*, is very common in leaf litter of moist and wet forests from southeastern Nicaragua and northwestern Costa Rica to northern Colombia (Savage, 2002). Anecdotal information on *L. xanthostigma* reproduction is in Fitch (1973), Savage (2002), Guyer and Donnelly (2005), and Köhler (2003). The purpose of this note is to supplement information on reproduction of *L. xanthostigma* from a histological examination of museum specimens. I also use histological data to verify previous information on *L. xanthostigma* reproduction based on macroscopic observations (Savage, 2002; Köhler, 2003).

Twenty-nine adult *L. xanthostigma* males (mean snout–vent length [SVL] = $31.1 \text{ mm} \pm 3.4 \text{ SD}$, range = 25–39 mm) and 40 adult females (mean SVL = $30.9 \text{ mm} \pm 3.9 \text{ SD}$, range = 24–38 mm) from Costa Rica were examined from the Natural History Museum of Los Angeles County (LACM), Los Angeles, California: Alajuela, LACM 148069, 148070; Guanacaste, LACM 148004, 148012, 148017, 148035, 148038, 148046, 148047, 148051, 148053, 148054, 148056, 148057, 148081, 148084, 148108–148110; Heredia, LACM 148002, 148003, 148014, 148016, 148018, 148026, 148028, 148033, 148041; Limón, LACM 130924, 130925, 130927–130929, 130936, 130938, 130940, 148005, 148007, 148009, 148027, 148043, 148058, 148059, 148063, 148066, 148067, 148072, 148073, 148077, 148079, 148080; Puntarenas, LACM 114228, 114230, 148023, 148029–148031, 148042, 148082, 148086, 148087, 148090, 148093, 148094, 148096, 148097, 148102, 148103, 148105.

Gonads were dehydrated in ethanol, embedded in paraffin, sectioned at $5 \mu\text{m}$ and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Enlarged ovarian follicles ($> 3 \text{ mm}$) or oviductal eggs were counted; no histology was done on them. Male and female mean body sizes (SVL) were compared with an unpaired *t*-test using Instat (vers. 3.0b, Graphpad Software, San Diego, CA).

There was no significant difference between male and female mean body sizes (unpaired *t*-test, $t = 0.160$, $df = 67$, $P = 0.87$). The only stage present in the male cycle was spermiogenesis (sperm formation) in which lumina of the seminiferous tubules are lined by groups of mature spermatozoa and rows of

metamorphosing spermatids are present. Epididymides contained sperm. Monthly samples of males undergoing spermiogenesis were: February ($n = 1$), March ($n = 3$), April ($n = 7$), May ($n = 2$), June ($n = 2$), July ($n = 7$), August ($n = 7$). The smallest mature males (spermiogenesis in progress) measured 25 mm SVL (LACM 148087, 148097) and were both collected in July.

Monthly stages in the ovarian cycle of *L. xanthostigma* are in Table 1. Four stages were observed: (1) Quiescent, no reproductive activity; (2) Early yolk deposition, basophilic vitellogenic granules (= secondary vitellogenesis *sensu* Aldridge, 1979) are present; (3) One enlarged ovarian follicle ($> 3 \text{ mm}$) is present; (4) One oviductal egg is present. All four stages were observed in July which had the largest sample ($n = 14$). The smallest reproductively active female measured 25 mm SVL (LACM 148043, 1 follicle $> 3 \text{ mm}$) and was from June. Mean clutch size for 30 females was 1.0 ± 0.0 . There was no evidence (concurrent yolk deposition in females with a follicle $> 3 \text{ mm}$ or

Table 1. Monthly stages in the ovarian cycle of *Lepidoblepharis xanthostigma* from Costa Rica.

Month	n	Quiescent	Early yolk deposition	Enlarged follicle $> 3 \text{ mm}$	Oviductal egg
February	1	1	0	0	0
March	4	0	0	1	3
April	6	3	0	2	1
May	4	0	1	0	3
June	4	0	0	1	3
July	14	3	2	3	6
August	4	0	0	2	2
December	1	0	0	1	0
September	2	0	0	1	1

an oviductal egg) to suggest multiple egg clutches are produced in the same year. While most gekkonids produce multiple clutches (see Vitt, 1986), this has yet to be documented for *L. xanthostigma*. Nevertheless, my data support Fitch (1973), Savage (2002) and Köhler (2003) who thought *Lepidoblepharis* had an extensive reproductive season. Continuous reproduction appears typical for tropical gekkonid species (Vitt, 1986).

Acknowledgments

I thank Christine Thacker (LACM) for permission to examine specimens and Sean Kark (Whittier College) for assistance with histology. *Lepidoblepharis xanthostigma* are part of the CRE (Costa Rica Expeditions) collection donated to LACM by Jay M. Savage.

Literature Cited

- Aldridge, R. D. 1979. Female reproductive cycles of the snakes *Arizona elegans* and *Crotalus viridis*. *Herpetologica* 35:256-261.
- Fitch, H. S. 1973. A field study of Costa Rican lizards. *The University of Kansas Science Bulletin* 50:39-126.
- Guyer, C., and M. A. Donnelly. 2005. *Amphibians and Reptiles of La Selva, Costa Rica, and the Caribbean Slope*. Berkeley: University of California Press.
- Köhler, G. 2003. *Reptiles of Central America*. Offenbach: Germany: Herpeton Verlag.
- Presnell, J. K., and M. P. Schreibman. 1997. *Humason's animal tissue techniques*, 5th Ed. Baltimore: The Johns Hopkins University Press.
- Savage, J. M. 2002. *The amphibians and reptiles of Costa Rica: A herpetofauna between two continents, between two seas*. Chicago: University of Chicago Press.
- Vitt, L. J. 1986. Reproductive tactics of sympatric gekkonid lizards with a comment on the evolutionary and ecological consequences of invariant clutch size. *Copeia* 1986:773-786.

Wild Snakes with Problems of Captive Snakes

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Abstract

A study of wild-caught snakes within a 60 km radius of the Central Business District in Melbourne, Australia, from 2001 through 2003 showed that more than half of adult tiger snakes (*Notechis scutatus*), copperheads (*Austrelaps superbus*) and brown snakes (*Pseudonaja textilis*) carried parasitic mites (of unknown species). In most snakes these mites were only detected after the reptiles were placed in a white plastic container with a segment of Shelltox Pest-strip with dichlorvos as the active ingredient, whereupon the mites fell off the snakes and died. Noticed in three snakes were constrictions of the tail that were consistent with failure to properly slough as seen in emaciated captive snakes that are infested with mites.

General

For some years, I have held a permit from the Victorian Wildlife Authority to trap and release reptiles that are deemed nuisances or a threat to safety of persons or their domestic pets. Essentially, the operation of the permit is as follows: A person, who is usually in a state of fear, phones me directly or by referral from another party such as a government authority, wildlife refuge or similar seeking the removal of a snake or other reptile. I then go to the address and attempt to capture the reptile, assuming it can still be found by the time I arrive at the address. In most cases the "offending reptile" is found and caught. By law the reptile is then released in suitable habitat nearby. A typical example is a large wildlife reserve such as Westerfolds Park in Melbourne's northeast.

Due to long-standing misgivings in terms of re-releasing species in new areas (see Hoser, 1995) and the fear of transmitting parasites and diseases to other populations of snakes, or for that matter to my own captive collection of snakes (many of which are Victorian native species), all caught snakes were placed in a container with a section of dichlorvos-based pest strip for at least 30 minutes after capture. [Editor's note: dichlorvos is an insecticide (2,2-dichlorovinyl dimethyl phosphate), also known as DDVP.] This is sufficient to kill all the mites on the snake and also small ticks. There is no detectable affect on the snakes.

For the record a typical dosage is a 2 cm × 3 cm section of (fresh) pest strip in a 30 cm long × 19.5 cm wide × 10.5 cm high enclosed plastic container (known as a click-clack), with ventilation holes in the lid. Used pest strip segments are stored in foil and plastic to retain potency, which will over time fade.

Any large ticks, sometimes seen on snakes, are either manually removed, or in some circumstances left on the snake overnight. In those cases the snakes are also left with a section of pest-strip, which usually results in the large ticks dying by morning. Sometimes snakes would be injected with ivermectin as an effective means to kill the ticks. Rarely, a spray would be used to kill the mites, but due to the slower death time of the mites from the spray, the pest strips were generally used on

"wild caught" snakes.

While mites are rarely seen on snakes (or large lizards) when removed from properties, except in unusual and heavy infestations, the fact is that following treatment as described, more than half are found to have mites on them.

In the period from 17 October 2001 to 22 November 2003, the following reptiles were removed by myself from properties in the Melbourne area. All were treated with pest strips.

- 5 brown snakes (*Pseudonaja textilis*)
- 28 tiger snakes (*Notechis scutatus*)
- 9 copperheads (*Austrelaps superbus*)
- 3 eastern blue-tongued skinks (*Tiliqua scincoides*)
- 1 blotched blue-tongued skink (*Tiliqua nigrolutea*)

Two of the brown snakes had mites, most of the tiger snakes had mites and all of the other reptiles had mites. In most cases between 10 and 30 were observed dead in the containers with the reptiles after treatment. For the copperheads, none showed signs of mite infestation until treated with the pest strip sections.

In conversations with herpetologists, the general perception has been that problems with mites are a feature of captivity. It's been asserted that population explosions of mites that lead to severe blood loss and emaciation in confined and constrained reptiles is a unique feature of captive reptiles. It's been asserted that wild reptiles are able to wander away from mites that fall off them, whereas in the captive situation, mites that are scraped off or fall off the reptile can then climb back onto them. Hence it's also been generally asserted that wild reptiles do not suffer as a result of the usually lower level mite infestations seen.

Some snakes retrieved by me did appear emaciated, in particular a large tiger snake found at 200 Nepean Highway, Seaford, on 7 November 2002, which had a severe tick and mite infestation. These parasites are common to Mornington Peninsula reptiles (see Hoser and Valentic, 1996, for another example).

Whether the emaciation occurred as a result of the parasites or the parasites took advantage of weakness in the reptile to gain a foothold on it, or a combination of both is not known. However, this paper seeks to demonstrate emphatically and for the

first time ever that parasitic mites can adversely affect reptiles in the wild state.

Tail Defects in Snakes

A number of snakes, including the Seaford tiger snake mentioned above, were missing ends of tails and showed other signs of injury. Bearing in mind that as a rule the snakes caught were set to be released more-or-less immediately, there was no real motive to pay much attention to so-called “battle scars” and other physical defects unless they really stood out. Hence the inspection of most snakes, including the Seaford one, was cursory and nothing more of relevance can be recalled.

On 11 March 2003, I retrieved a 40-cm male tiger snake from 3 Edward Court, Ivanhoe, in inner suburban Melbourne. This area is adjacent to the Yarra River and in spite of its proximity to the Melbourne Central Business District has lots of tiger snakes. This snake was found to be somewhat emaciated and to have mites, with about 60 falling off when the snake was treated. This is very a high number of mites based on the small size of the snake.

The snake was noticed to have sections of unsloughed skin on the anterior neck region and also a constriction of unsloughed skin towards the end of the tail. The constriction was so severe as to have left the end part of the tail dried and shrivelled and it appeared that without intervention it would simply fall off over time as all that appeared to be left was bone. This was the last 2.5 cm of tail.

Mites are known to cause severe emaciation in snakes and in the captive state shedding problems and mites seem to go hand in hand. The pattern of shedding problems in this wild snake fitted the profile of what I have observed in countless captive snakes affected by mites. Based on the lack of other alternatives, it appears that in this wild snake, its shedding problems were directly attributable to the mites.

Subsequent to this a large tiger snake was caught on a property at 89 Banyule Road, Rosanna. This snake had a constriction about 3 cm from the end of its tail. At a glance it appeared

to be a wound from an attack by an animal, but further inspection revealed that the section of tail had a constriction around the affected section with normal scales beyond that. This feature did not appear to be a battle wound or birth defect and hence I could only attribute it to a sloughing problem at some stage past. This snake did carry mites, but only about 10 fell off it when treated. As the snake was over a meter long, it'd be likely that the few mites on it at the time of capture were not causing it discernable harm then.

On 21 November 2003 I retrieved a 1.2-m copperhead from the Bayside Christian College at Robinsons Road, Baxter. This snake, while in immediate pre-slough (eyes cleared after clouding), appeared to be in optimal condition. When treated with pest strip about 20 mites fell off it, which for a wild snake of that size is a negligible infection. The snake also carried at least two large ticks. As mentioned already, both parasites are common on wild-caught snakes in the Mornington Peninsula region (which includes Baxter). This snake also had a moderate constriction evident about 2 cm from the end of the tail tip, although the scales beyond the constriction were perfectly normal and healthy. The constriction again indicated a sloughing problem as opposed to other cause.

Conclusion

Diseases, ailments and husbandry issues thought to be manifestations of captivity, may also occur in wild snakes. It is likely that some of these issues, including mite infestations and mite-related problems are more prevalent than previously thought and have been merely overlooked by field workers in the past.

Acknowledgments

Numerous private keepers and field collectors have shared their experiences with me and given me unfettered access to collections and data. The Victorian Wildlife Department (called Department of Sustainability and Environment (DSE) this week) provided the relevant permit (number CC2027519) and this is gratefully acknowledged.

Literature Cited

Hoser, R. T. 1995. Release into hell. *Monitor* 7(2):77-88.

Hoser, R. T., and R. Valentic. 1996. Notes on a herpetological field trip in the Australian State of Victoria. *Monitor* 7(2):24-34.

What You Missed at the July CHS Meeting

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In 2005 there were three armed factions in a bitter struggle over control of an area along the eastern border of the Democratic Republic of the Congo (DRC) centered on a plateau called the Itombwe Massif. Massacres had just taken place in other parts of the country. The situation was tense. Control over the region was divided and fluid. Sounds like an area normal people like to avoid? Not Dr. Ben Evans. He decided to do a herpetological survey of the area.

If that revelation hadn't come about halfway through his presentation, I might have questioned his competency and his sanity. As things stood, I merely stared incredulously. I enjoy fieldwork as much as the next person, but to fly into Rwanda, drive to the Albertine Rift, take a 7-hour boat ride across Lake Kivu to the base of a massive plateau, hike through mud up the steep side of the plateau where one must delicately deal with armed soldiers whose language is incomprehensible while attempting to get their permission to catch frogs, all the while mostly staying soaked to the skin? Well, that's something I'd have to think about. Really think about. Dr. Evans said, "I'm not brave, I'm curious." We all know what curiosity did to the cat.

Ben Evans was born in New York, graduated from Columbia University with a doctorate, did his postdoc work at University of Texas, Austin, and is currently an assistant professor of biology at McMaster University in Hamilton, Ontario. His major interest is biodiversity conservation, and toward that goal he studies the genomes of various animals in order to better define diversity hot spots around the world, but mostly in Indonesia, Southeast Asia and Africa. He also studies polyploid animals, mostly frogs, in order to gain insights into the role that gene duplication may play in species diversity.

His title slide had a picture of *Rana siberu*, a glossy, dark frog, striped and spotted with bright orange, and the words "Evolutionary Processes and Species Diversity: Insights at the Molecular Level." He first built the case for biodiversity, a soft sell to our crowd, but he mentioned points that I had not thought of before. Biodiversity exists not only in speciation, but also in life processes and ecosystems. Biodiversity hot spots can be protected, and Ben cited evidence that even in poorly policed national parks, the diversity is higher than in areas that lack any protection. With limited land likely to be protected, it's important that we establish the parks in areas that will maintain the highest diversity, a task more difficult than it sounds but one that can be facilitated with genetic studies. Such studies can lead to better definition of truly diverse ecosystems. Ben used great slides and



Ben Evans, with his title slide showing in the background. Photograph by Dick Buchholz.

maps to illustrate these points, including a world map of high biodiversity areas around the world. Being a map lover, I could stare at that map for a long time.

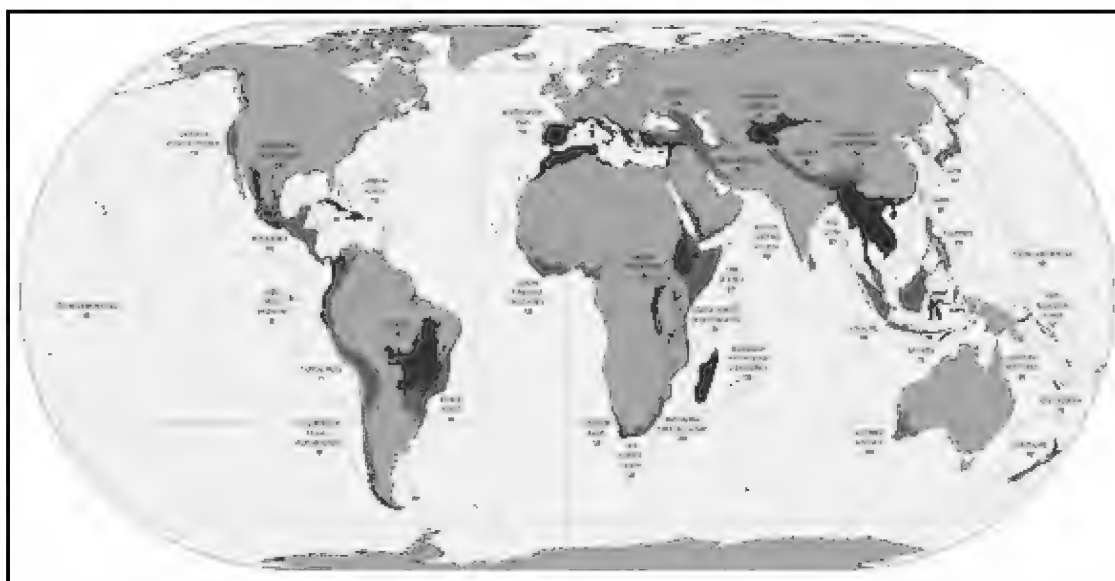
Where he started was on the island of Sulawesi in Indonesia. It's the one that looks like a K with a bad back. He chose that



One of the stars of Ben's studies in Sulawesi, *Bufo celebensis*.

island because the macaque monkeys on that island had been studied extensively and it is one of the world's most diverse hot spots. His aim was to discover whether abiotic or biotic factors

created the diversity on the island. First he established that there is substantial genetic difference between macaque populations. Then he used genetic markers from the Sulawesi toad (*Bufo celebensis*) populations to support geographic isolation as the primary cause of the diversity on the island. Essentially, because the toad genetics closely paralleled the monkey ge-



Worldwide biodiversity hot spots.



On the Itombwe Massif dinner may be as much a trial as the hike.

netics, he showed that the physical breakup of the island in times of higher seas probably contributed to the different populations rather than habitat fragmentation. He confirmed this using populations of fanged frogs (*Limnonectes* cf. *grunniens*) on the island, though with the frogs some populations seemed to overlap, evidence that the frogs may have expanded their ranges after the island coalesced.

Why is this important? Remember that only a fraction of the habitat can be protected. So if Dr. Evans can establish what areas hold the most diversity, efforts for protection can be concentrated where they're needed most.

At this point Ben took us several thousand miles from Sulawesi on the adventure that started out this article. He was in search of the ancestral species to the polyploid clawed frogs (*Xenopus* spp.) he had studied to try and determine what advantage polyploidy may confer on the species that have it. I'm not going to go into details about that, because I didn't have my recorder and I'm sure that I'd screw up some important points. But Ben, using photos, video, and recordings, made us appreciate the study and why it has value. The expedition into Africa failed to find the ancestors he was seeking, but he did discover



Dead *Xenopus itombwensis* soon after Dr. Ben Evans discovered the species in 2005.



Illegal logging is one of the primary threats to biodiversity.

(and recently describe) a new octoploid species of clawed frog, *Xenopus itombwensis*, found in only one lake on the plateau. We got to see video! We then saw a picture taken later by another researcher showing huge numbers of the frogs dead. Another possible extinction before an animal can be studied, and Dr. Evans doesn't know the cause.

I continue to be impressed by people who are quietly doing cutting edge research in attempt to make sure that our earth continues to be a hospitable place for all creatures, including ourselves. Just to show Ben's humor, he was asked about the dangers of going into the DRC. He smiled and said that he had to confess that to get the picture of the ominous looking soldiers in a hut with him, he asked the soldiers to look mean. He has another picture with them all smiling and looking the best of friends. Once again I urge you to avoid using my writing as a substitute for attending the meetings if you can. I can't describe Ben's humor, his colorful slides of people, animals, and habitat, or the pleasure of his company over dinner after the meeting.



Trying to convince the local armed forces that he's just hunting frogs.

Unofficial Minutes of the CHS Board Meeting, July 18, 2008

The meeting was called to order at 7:35 P.M. at the Schaumburg Public Library. Board members Dan Bavrisha, Matt O'Connor, Amy Sullivan and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the June 13 board meeting, which were accepted as read. Mike Dloogatch made suggestions for future minutes.

Treasurer: Andy Malawy ran through the June financial reports. No questions were raised.

Membership Secretary: Membership remained the same for the month of June. We have 11 new members so far for the month of July. List of nonrenewals was once again shared with the board.

Corresponding Secretary: Deb dealt with a person convinced that they had baby copperheads in their high rise.

Committee Reports

Shows:

- Lake County Reptile Show, August 9. Cindy will be unable to attend, John Archer will attempt to cover.
- Lt. Governor's booth at the Illinois State Fair, August 15–16.
- NARBC is scheduled for October 11–12.

Adoptions: Linda has had a lot of water turtle surrender calls lately.

Old Business

Symposium 2009: The hotel contracts are being prepared and we are leaning towards Georgio's. We have Kevin Fitzgerald for our banquet speaker. We have initial contacts out to the primary speakers on our list. The auction committee will be Linda, Deb and Cindy. Pricing details need to be arranged. Cindy has contacted her list of speakers, as well as Bob and Brian in regards to a discount to our attendees.

Zoo Trip: Toledo Zoo trip is August 10. Participants will be charged \$50 for the bus ride and will pay their own zoo admission. Adult admission is \$8.00 and \$6.00 for children. The bus will be leaving from the Notebaert Nature Museum. Mike Dloogatch moved that we authorize Jason Hood to book the bus

for the trip at \$1150. Nancy Kloskowski seconded. Approved unanimously.

CHS Forum—"Now Hiring" page: Cindy is looking for various items that we need worked on.

CHS business cards: John brought a design for the board to see. Everyone liked it and we should have the cards available soon.

Pull-out sign—design contest: Cindy is going to go ahead with starting a contest for design. Keep posted for the information on the Now Hiring Forum.

Website: Aaron did a GREAT job! We plan to offer board members email addresses at chicagoherp.org. We will look at adding a section where visitors can submit any herp questions they might have. Another possibility is an online store offering various CHS items such as T-shirts and magnets.

New Business

December General Meeting: John Archer still needs to finalize the date change.

Year of the Frog video: Dave McGowen is putting together a frog video, and seeks CHS help, either with funding or in other ways.

Herpers Movie: Dav Kaufman would like to use our logo for the his movie "Herpers" and we will send him one.

Rob Carmichael show - Rob would like to have the CHS present at this event. Jason feels it's a good event for CHS to back.

Round Table

Deb has a mystery turtle egg that she will be bringing to the meeting to examine.

Bob apologized to those on the board who have been pestered by the media and thanked all for helping him maintain anonymity.

Josh earned a rainbow boa in place of the supposed Burmese python that he was supposed to pick up.

The meeting adjourned at 9:30 P.M.

Respectfully submitted by recording secretary Cindy Rampacek



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Herpetology 2008

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

EVOLUTIONARY ORIGIN OF SNAKE FANGS

F. J. Vonk et al. [2008, *Nature* 454:630-633] note that many advanced snakes use fangs to introduce venom into prey or attacker. Various front- and rear-fanged groups are recognized, according to whether their fangs are positioned anterior (for example cobras and vipers) or posterior (for example grass snakes) in the upper jaw. A fundamental controversy in snake evolution is whether or not front and rear fangs share the same evolutionary and developmental origin. Resolving this controversy could identify a major evolutionary transition underlying the massive radiation of advanced snakes, and the associated developmental events. The authors examine this issue by visualizing the tooth-forming epithelium in the upper jaw of 96 snake embryos, covering eight species. They use the sonic hedgehog gene as a marker, and three-dimensionally reconstruct the development in 41 of the embryos. They show that front fangs develop from the posterior end of the upper jaw, and are strikingly similar in morphogenesis to rear fangs. This is consistent with their being homologous. In front-fanged snakes, the anterior part of the upper jaw lacks sonic hedgehog expression, and ontogenetic allometry displaces the fang from its posterior developmental origin to its adult front position—consistent with an ancestral posterior position of the front fang. In rear-fanged snakes, the fangs develop from an independent posterior dental lamina and retain their posterior position. In light of these findings, the authors put forward a new model for the evolution of snake fangs: a posterior subregion of the tooth-forming epithelium became developmentally uncoupled from the remaining dentition, which allowed the posterior teeth to evolve independently and in close association with the venom gland, becoming highly modified in different lineages. This developmental event could have facilitated the massive radiation of advanced snakes in the Cenozoic era, resulting in the spectacular diversity of snakes seen today.

NONINVASIVE SAMPLING FOR GENETIC ANALYSIS

R. Jones et al. [2008, *The Herpetological Journal* 18(1):32-39] note that genetic studies of native herpetofauna populations are important for the conservation of European biodiversity, but previous studies have been largely dependent on invasive sample collection. They explore the efficiency of noninvasive sampling (NIS) for molecular studies and review the various potential sources of such samples. Snakes produce a multitude of by-products, such as sloughed skin, feces and eggs or embryos, that, along with road kills, predated specimens and museum samples, could potentially be used in molecular studies. The authors describe a new method for obtaining snake feces in the field and, using mitochondrial cytochrome b primers, successfully amplified 500 and 758 bp sequences from a variety of tissues collected by NIS. The availability and degradation of such material differed greatly, and both DNA extraction and PCR success appeared dependent upon sample origin and stor-

age. Nevertheless, this study demonstrates for the first time that fecal, egg and fetal tissues, as well as sloughed skin and carcasses, represent valuable NIS source material permitting genetic studies with minimal disturbance to the individual and its population.

HABITAT USE BY DESERT TORTOISES

J. D. Riedle et al. [2008, *Copeia* 2008(2):414-420] report that desert tortoises (*Gopherus agassizii*) in the Sonoran Desert typically occur on rocky slopes and bajadas and are absent from intermountain valley floors. Tortoises also occur along deeply incised washes emanating from rocky bajadas, using caliche caves as shelter sites. The Florence Military Reservation (FMR), in south-central Arizona, is typified by gently sloping alluvial fans bisected by steeply incised washes. One 10.9-ha hill consisting of volcanic outcrops and boulders occurs at the northern end of the reservation. Tortoise locations at FMR were concentrated around incised washes with dense caliche caves or near the volcanic hill. Home ranges of male and female tortoises were not significantly different, and the sexes used shelter types similarly. Tortoises used caliche caves as shelter more than other shelter types, especially those tortoises without access to the rocky hill. Compositional analysis of the three principal habitat types used by tortoises at FMR revealed that they selected incised washes over the other habitat types. However, the authors did not find tortoises in washes with few caliche caves. These results suggest that availability of shelter sites strongly influences tortoise distribution at FMR.

ONTOGENETIC CHANGES IN HABITAT USE AND MOVEMENT PATTERNS IN BLACK RATSNAKES

G. Blouin-Demers et al. [2007, *Herpetologica* 63(4):421-429] note that many animals exhibit pronounced shifts in ecology (e.g., habitat use, diet) as they grow. The central goal of this study was to determine whether habitat use and movement patterns of juvenile black ratsnakes (*Elaphe obsoleta*) differed from patterns previously documented for adult ratsnakes and to determine the conservation implications of any changes identified. Results showed a shift in habitat use by black ratsnakes with body size; juveniles used macrohabitats and microhabitats in proportion to their availability, unlike adult black ratsnakes that have been shown to prefer forest edges at both scales. Frequency of movement declined with body size, whereas distance traveled per move increased with body size. Habitat selection and movement patterns may be a result of ontogenetic shifts in thermoregulatory behavior associated with changes in body size, or alternatively, may reflect size-related variation in predation risk. Home range size and fidelity, and fidelity to hibernacula all increased with body size. Despite ontogenetic changes in habitat use and movement by ratsnakes, recommendations regarding critical habitat for adults of this species should be adequate to protect juveniles.

CONSPECIFIC CUES AND FOLLICULAR DEVELOPMENT IN THE LEOPARD GECKO

L. D. LaDage and M. H. Ferkin [2008, Behaviour 145(8): 1027-1039] note that sexually reproducing organisms must process and respond to internal and external stimuli to successfully synchronize physiological and behavioral processes involved in reproduction. One such cue is an individual's social environment. Interactions with conspecifics affect a female's reproductive activity by inducing, suppressing, and/or accelerating reproductive processes. For example, many studies support the theory that the presence of a same-sex conspecific may suppress an animal's reproductive physiology, whereas an opposite-sex conspecific may stimulate an animal's reproductive physiology. This study looked at whether exposure to a conspecific male or female affects the onset of follicular development in sexually-experienced female leopard geckos, *Eublepharis macularius*. The data show that follicular growth was not affected by whether female geckos were housed next to a male conspecific, a female conspecific, or isolated from conspecifics. In addition, the number of days until the initiation of follicular development of female geckos was not affected by whether the females were housed in the presence of a conspecific or in isolation. The results are discussed within the theoretical framework of the effects of social cues on the reproductive physiology of females and the limited empirical data about such effects in squamate lizards.

WORLD'S SMALLEST SNAKE

S. B. Hedges [2008, Zootaxa 1841:1-30] describes two new diminutive species of snakes from the Lesser Antilles: *Leptotyphlops carlae* from Barbados and *Leptotyphlops breuili* from Saint Lucia. He notes that islands are viewed as natural evolutionary laboratories for terrestrial organisms because they have boundaries that limit dispersal and often reveal evolutionary patterns and mechanisms. One such pattern is that the smallest and largest species of different types of tetrapod animals are frequently found on islands. *Leptotyphlops carlae* is the smallest species of snake known and has a total adult length of approximately 100 mm. Limited evidence indicates a clutch size of one and a greatly elongated egg shape (length/width). Comparison of egg shapes in snakes indicates that the shape is a packaging phenomenon, related primarily to the shape of the available body cavity and clutch size. For a clutch size of one, expected egg shape is eight whereas expected egg shape drops to two at a clutch size of ten. The body shape of snakes, defined as snout-to-vent length divided by width, also varies and influences the shape of snake eggs. The smallest snakes are typically stout-bodied with shapes of 30–35 whereas the longest snakes usually are more elongate, with shapes of 45–50. The allometry of organ size also affects clutch size and shape, because the smallest snakes have the smallest proportion of body cavity space available for reproduction. The best explanation for the observation of body size extremes on islands is that colonizing species have adapted to open ecological niches that would otherwise be occupied on the mainland. Island colonists encounter novel environments and reduced interspecific competition, allowing species to evolve physical traits, including extremes in size, not normally seen on continents. However, the lower limit

of adult size appears to be constrained by the allometry of morphology, physiology, and reproduction. The smallest tetrapods have small clutches, usually one egg or young, and offspring that are relatively large. In the smallest snakes, offspring are one-half of the length of adults, compared with 10% adult length in the case of large species of snakes. Thus the evolutionary tradeoff between number and size of offspring appears to have reached a size boundary in these species, limiting the evolution of yet smaller species.

STOMACH CONTENTS AFTER PITFALL TRAPPING

G. C. Costa et al. [2008, The Herpetological Journal 18(1): 45-48] note that pitfall trapping is a widely used sampling method in amphibian and reptile studies. Despite their broad use and numerous advantages, the question of whether diets of trapped animals differ from those under natural conditions remains uninvestigated. The authors use data on eight lizard species to test the hypotheses that lizards captured in pitfall traps differ in diet composition and/or have higher stomach content volumes when compared to lizards collected using other methods. The basis for these hypotheses is that many common lizard prey items fall into the traps and are thus available to trapped lizards. Testing these hypotheses is critical to validate the results of diet studies that use animals taken from pitfall traps. Results showed that lizards collected from pitfall traps did not differ significantly from lizards collected outside the traps in diet composition or volume of prey consumed. However, two species (among eight) had different stomach content volumes inside the traps; one (*Anolis chrysolepis*) had a higher volume and the other (*Tropidurus oreadicus*) had a lower volume. For the species studied, the authors found that lizards collected with pitfall traps can be used in diet studies. Nevertheless, they recommend checking traps at least once a day to avoid prolonged exposure to different prey items, collecting large sample sizes, and also collecting animals outside the traps.

GREEN SALAMANDER LIFE HISTORY PARAMETERS

J. L. Waldron and T. K. Pauley [2007, J. Herpetology 41(4): 638-644] note that growth and age at reproductive maturity are two life-history parameters that add an important temporal component to species conservation, yet such information is seldom available for plethodontid salamanders. They modeled growth and age at maturity for a northern West Virginia population of green salamanders, *Aneides aeneus*, using snout-vent length (SVL) growth intervals from a five-year mark-recapture study. Growth data were fit to the von Bertalanffy and logistic growth interval models and compared using the residual error mean square. The logistic model provided the best fit to the recapture data, indicating that green salamanders grow slowly for plethodontids and take 7–8 yr to reach reproductive maturity. The study revealed that green salamanders mature at a later age than most plethodontid species, implying that the species might have greater generation time and longevity than previously suspected. These data may offer insight into why the species is sensitive to population declines. The authors suggest that future research focus on green salamander longevity and generation time to provide a framework from which comparisons can be made across populations.

TRANSLOCATION OF DWARF CHAMELEONS

A. J. Armstrong [2008, *African J. Herpetology* 57(1):29-41] notes that the coastal population of the black-headed dwarf chameleon, *Bradypodion melanocephalum*, is threatened by rapid urban expansion in and around Durban, which lies in the center of the chameleon population's distribution. Translocations of threatened species from urban development sites is a mitigation method that is used in various parts of the world. The translocation of *B. melanocephalum* largely by volunteers from a proposed light industrial business park to two neighboring areas with partially restored habitats was eventually successful in one recipient area and unsuccessful in the other. The results suggest that translocations of *B. melanocephalum* from development construction sites to recipient areas will only be successful if adequate time and resources are available for: a) finding and securing suitable areas for habitat restoration; b) sufficient restoration of the indigenous vegetation in the recipient areas before the capture and translocation of *B. melanocephalum* from the proposed development sites; c) searching for, and capture of, all *B. melanocephalum* on the development sites, and; d) long-term management of the restored habitat in a manner that does not result in significantly elevated mortality or dispersal of *B. melanocephalum*. Monitoring of *B. melanocephalum* numbers in the recipient sites, by at least two people per transect, is important to gauge the success or otherwise of the translocation. Monitoring can give insights into the controllable factors that have an impact on the numbers of chameleons, and provide suggestions as how to improve the management of the habitat.

OVERWINTERING PAINTED TURTLES

N. Rollinson et al. [2008, *J. Herpetology* 42(2):312-321] compared shell temperatures of painted turtles (*Chrysemys picta*) overwintering in two different ponds in Algonquin Park, Canada, over one winter. Movements under the ice occurred from late November into late December or early January, and based on thermal data, turtles were likely not buried in the substrate. Over the course of the winter, one pond became severely hypoxic, whereas the other remained more highly oxygenated. Turtles in the hypoxic pond exhibited significantly lower shell temperatures than did the turtles in the normoxic environment, despite significantly cooler average water temperatures in the normoxic pond. Painted turtles submerged in normoxic water can assimilate O₂ through extrapulmonary means, and cutaneous O₂ uptake at low temperatures would significantly delay the onset of metabolic acidosis. Therefore, the authors suggest that, in their study, turtles in the hypoxic environment likely could not assimilate O₂ cutaneously; thus, these individuals may have voluntarily selected low temperatures to delay metabolic acidosis and conserve energy stores for the active season. The limited data suggest that painted turtles possess behavioral adaptations to detect and respond to aquatic hypoxia.



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Herp tours: **Madagascar—Tortoise Tour & Chameleon Tour** seeking adventurous members for January–February 2009. The goal of the tortoise tour, to be co-led by **Peter Pritchard** of the Chelonian Research Institute and **Bill Love**, will be to see all native species in the wild and record various aspects of their lives photographically. The later chameleon tour, co-led by **Mike Monge** of FL Chams and **Bill Love**, will focus on panther chameleons, trying to find and photograph as many of the color morphs as possible in the wild. Details are at Blue Chameleon Ventures' site at: www.bluechameleon.org.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, August 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Dr. Michael Lannoo**, a professor at the Muncie Center for Medical Education, Indiana University School of Medicine, will speak on amphibian malformations. Dr. Lannoo is a major figure in the amphibian decline investigations being conducted in the Midwest and the nation. His most recent book, published last month by the University of California Press, is *Malformed Frogs: The Collapse of Aquatic Ecosystems*.

Speaking at the September 24 meeting will be **Dr. Mark A. Mitchell**, an associate professor at the University of Illinois College of Veterinary Medicine.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum — the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

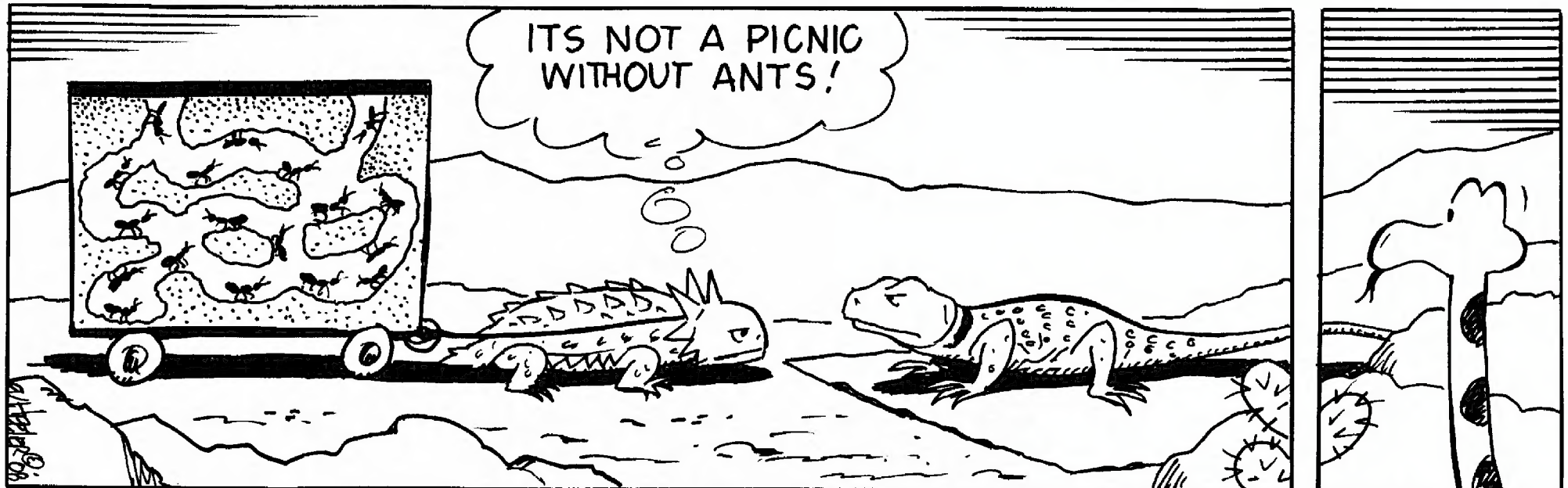
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., September 12, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

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